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(54) **Wireline centralisation apparatus and method**

Vorrichtung und Verfahren zum Zentrieren eines Bohrlochseils

Dispositif et procédé pour centrer un câble de manoeuvre

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Description

[0001] The present invention relates to apparatus and methods for use in wireline valves or, particularly but not exclusively used in the oil and gas industries.

[0002] Conventionally, ram assemblies are used inside a wireline intervention product called a wireline valve, and the sole purpose of ram assemblies is to provide a safety barrier against well pressure whilst remedial work is carried out on the wire. Such remedial work may be required if for example, the wire has a broken strand or has "bird caged" which causes the wire to get jammed in another piece of equipment, such as a greasehead which is located at the top of the intervention string above the wireline valve. In such a scenario, the only known solutions to this problem are either to chop the wire and fish it out afterwards or to seal around the wire below the problem area. A wireline valve is used to perform the latter solution.

[0003] The high pressures inside the well mean that, conventionally, the only reliable way to achieve a seal in the wireline valve is with rubber seals mounted on the inner most faces of the ram assemblies. A middle portion of the outer surface of the rubber seals comprise a recess which conforms to the outer surface of the wireline, and grease is pumped into the inner armours of the wireline; the viscosity of the grease drops the pressure within the inner armours. However, at these high pressures, rubber tends to behave like a fluid and as such needs something to prevent it being flushed away by the pressure. The common solution to this problem is the use of steel plates which retain the rubber in place. Therefore, the wireline has to be brought into a specific area of the ram seal so that when the ram assemblies are closed, the remaining rubber that is not involved in sealing around the wire is also backed up by steel. Currently this is achieved by guiding the wire into the middle of the well bore where the recess in the ram seal is located.

[0004] There are three main different types of mechanism for guiding the wire into the middle of the well bore, these being:-

1) Flat plate replaceable guide rams, as shown in Fig. 1. These were the first type of guides to be offered in the market place and are probably the most straightforward to manufacture.
However they suffer the disadvantage that the guides cannot, under certain geometry's, be made to pick up a wire located at the edge of the through bore, and there is also a possibility that the guides could be dropped down the well;

2) Curved replaceable guide rams, as shown in Fig. 2. These rams have curved guides allowing them to pick up the wireline from the very edge of the throughbore of the wireline valve.
However, they also suffer from the disadvantage that the guides could be dropped down the well; and

3) Integral guide rams, as shown in Fig. 3 and as described in US Patent No 3,692,316. These rams have the guides formed integrally with the ram assemblies, and were produced to solve the problems of bits dropping down the well as discussed in 1) and 2) above. These rams also provide greater mechanical strength to the ram assembly when closed, as the guide fingers interlock in the opposing ram bore creating a span beam in bending rather than a cantilevered beam. This has allowed the use of these integral guide rams in higher pressure wireline valves such as 103421.4 kPa (15000 p.s.i.) sets. However, these rams suffer from the disadvantage that they are expensive to manufacture, due to the more complex machining required.

[0005] Recently, there has been a significant increase in the number of incidents where the ram assemblies of various wireline valves have been closed and, instead of guiding the wire and sealing around the wire, the ram assemblies have crushed or completely cut the wireline. This is obviously not acceptable.

[0006] Extensive testing has shown that under certain conditions of wire tension and angle through the wireline valve, all of the above ram types 1), 2) and 3) may crush or cut the wireline and it has also been determined that none of them will guide a slack wire into the correct position.

[0007] In accordance with a first aspect of the present invention, there is provided an apparatus for moving an elongate member which passes through a throughbore of a valve device, the apparatus comprising an upper movement mechanism and a lower movement mechanism spaced apart about a portion of the valve device, the upper and lower movement mechanisms being actuable such that they are capable of moving the elongate member into a pre-determined position, characterised in that at least one of the upper and lower movement mechanisms comprises at least two pairs of guide arms which are adapted to move the elongate member into a predetermined position.

[0008] In accordance with a second aspect of the present invention, there is provided a method of moving an elongate member which passes through a throughbore of a valve device, the method comprising providing an upper movement mechanism and a lower movement mechanism spaced apart about a portion of the valve device, characterised in that at least one of the upper and lower movement mechanisms being provided with at least two pairs of guide arms such that actuation of at least one of the upper and lower movement mechanism moves the elongate member into a pre-determined position.

[0009] The elongate member is typically a wireline, logging line, cable or the like. The pre-determined position is typically a position substantially parallel to a longitudinal axis of the valve device and more preferably is substantially co-incident with the longitudinal axis of the

valve device, such that the upper and lower movement mechanism are preferably respective upper and lower centralising mechanisms.

[0010] In a preferred embodiment, the upper centralising mechanism comprises at least one pair of guide arms which are adapted to move the elongate member toward the longitudinal axis, typically upon movement of the guide arms in a direction substantially perpendicular to the longitudinal axis of the valve device.

[0011] More preferably, the upper centralising mechanism comprises two pairs of said guide arms. Typically, one pair of guide arms of the upper centralising mechanism are provided on a first ram assembly, and a second pair of guide arms of the upper centralising mechanism are provided on a second ram assembly. Typically, the first and second ram assemblies are arranged substantially diametrically opposite one another about the longitudinal axis of the throughbore. Preferably, each of the pair of guide arms of the upper centralising mechanism are arranged about a recess adapted to accept the elongate member therein, and more preferably, each of the pair of guide arms taper outwardly at an angle from the longitudinal axis of the respective ram assembly, where said angle may be in the region of 60° to 45°. Preferably, each pair of guide arms ot the upper centralising mechanism taper outwaraly to an extent at least as great, and preferably greater than, the diameter of the throughbore of the valve device.

[0012] More preferably, the lower centralising mechanism comprises two pairs of said guide arms. Typically, one pair of guide arms of the lower centralising mechanism are provided on a first ram assembly, and a second pair of guide arms of the lower centralising mechanism are provided on a second ram assembly. Typically, the first and second ram assemblies are arranged substantially diametrically opposite one another about the longitudinal axis of the throughbore. Preferably, each of the pair of guide arms of the lower centralising mechanism are arranged about a recess adapted to accept the elongate member therein, and more preferably, each of the pair of guide arms taper outwardly at an angle from the longitudinal axis of the respective ram assembly, where said angle may be in the region of 60° to 45°. Preferably, each pair of guide arms of the lower centralising mechanism taper outwardly to an extent at least as great, and preferably greater than, the diameter of the throughbore of the valve device.

[0013] The pair of guide arms of the upper centralising mechanism of one of the ram assemblies is preferably arranged to butt against a portion of the pair of guide arms of the upper centralising mechanism of the other of the ram assemblies, and more preferably, is arranged to butt against in a close fitting manner. Typically, a surface of the pair of guide arms of the upper centralising mechanism of one of the ram assemblies is preferably arranged to be a sliding fit with a surface of the pair of guide arms of the upper centralising mechanism of the other of the ram assemblies. The sliding fit arrangement provides the advantage that, as the guide arms are brought together, the elongate member is denied the opportunity to be trapped between the two sliding surfaces.

[0014] The pair of guide arms of the lower centralising mechanism of one of the ram assemblies is preferably arranged to butt against a portion of the pair of guide arms of the lower centralising mechanism of the other of the ram assemblies, and more preferably, is arranged to butt against in a close fitting manner. Typically, a surface of the pair of guide arms of the lower centralising mechanism of one of the ram assemblies is preferably arranged to be a sliding fit with a surface of the pair of guide arms of the lower centralising mechanism of the other of the ram assemblies.

[0015] Typically, the recesses of the upper centralising mechanism and the recesses of the lower centralising mechanism are arranged to be coincident with the longitudinal axis of a recess of an inner sealing member of the valve device.

[0016] Most preferably, each of the pair of ram assemblies comprises an upper and lower centralising mechanism. Typically, the upper and lower centralising mechanism are located immediately about an inner sealing member of the wireline valve.

[0017] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of a prior art ram assembly for a wireline valve as discussed in 1) above;

Fig. 2 is a perspective view of a prior art ram assembly as discussed 2) above;

Fig. 3(a) is a perspective view of a first prior art ram assembly as discussed in 3) above;

Fig. 3(b) is a perspective view of a second prior art ram assembly, which only differs from that shown in Fig. 3(a) by the inclusion of a ram key, as discussed in 3) above;

Fig. 4(a) is a perspective side view of a first ram assembly for a wireline valve in accordance with the present invention, intended for use with the ram assembly of Figs. 5(a) to 5(i);

Fig. 4(b) is a bottom view of the ram assembly of Fig. 4(a);

Fig. 4(c) is a side view of the ram assembly of Fig. 4 (a) ;

Fig. 4(d) is a plan view of the ram assembly of Fig. 4(a) ;

Fig. 4(e) is a rear end view of the ram assembly of Fig. 4(a);

Fig. 4(f) is a sectional view through section A-A of Fig. 4 (c) ;

Fig. 4(g) is a sectional view through section B-B of Fig. 4(b);

Fig. 4(h) is a sectional view through section C-C of Fig. 4(c) ;

Fig. 4(i) is a sectional view through section D-D of

Fig. 4 (c) ;
Fig. 5(a) is a perspective side view of a second ram assembly for a wireline valve in accordance with the present invention, intended for use with the ram assembly of Figs. 4(a) to 4(i);
Fig. 5(b) is a plan view of the ram of Fig. 5 (a) ;
Fig. 5(c) is a side view of the ram of Fig. 5 (a) ;
Fig. 5(d) is a bottom view of the ram of Fig. 5(a) ;
Fig. 5(e) is a rear end view of the ram of Fig. 5 (a);
Fig. 5(f) is a sectional view through section A-A of Fig. 5(b);
Fig. 5(g) is a sectional view through section B-B of the ram of Fig. 5(c);
Fig. 5(h) is a sectional view through section C-C of the ram of Fig. 5(c);
Fig. 5(i) is a sectional view through section D-D of the ram of Fig. 5 (d) ;
Fig. 6 is a detailed perspective view of the ram assemblies of Fig. 5(a),
Fig. 7 is a detailed perspective view of the ram assemblies of Fig. 4(a) and Fig. 5(a) being brought together, but with the wireline valve omitted for clarity;
Fig. 8 is a detailed perspective view of the ram assemblies of Fig. 4(a) and Fig. 5(a) being brought closer together, with the wireline valve omitted for clarity; and
Fig. 9 is a plan view of the ram assemblies of Fig. 4(a) and Fig. 5(a), shown in spaced apart relation about the throughbore of the wireline valve, with the rest of the wireline valve omitted for clarity.

[0018] As discussed above, Figs. 1, 2, 3(a) and 3(b) show prior art ram assemblies and are not in accordance with the present invention.

[0019] Fig. 4(a) shows a first embodiment of a ram assembly 10 in accordance with the present invention. The first ram 10 should be considered for the sake of clarity as the right hand side ram 10.

[0020] The ram 10 comprises a rear face 12, and which is formed a slot 14, the purpose of which will be detailed subsequently.

[0021] The body of the ram 10 is substantially cylindrical, and comprises a part circumferential seal slot 16 into which an outer seal (not shown in Fig. 4(a) to Fig. 4(i) but shown in Figs. 1-3(b)) is placed.

[0022] The ram 10 comprises a pair of wireline guides 18, 20 which extend outwardly from an innermost end 22 of the cylindrical ram body 11. The upper surface of the upper wireline guide 18 is part circumferential, whilst the lowermost surface of the upper wireline guide 18 is planer and is parallel to the longitudinal axis of the cylindrical ram body 11.

[0023] The uppermost surface of the lower wireline guide 20 is planer, as is the lowermost surface of the lower wireline guide 20, with both the uppermost and lowermost surfaces of the lower wireline guide being parallel to the longitudinal axis of the cylindrical ram body 11.

[0024] A recess 19 is formed at the centre of the front face of the upper wireline guide 18, and the recess 19 is arranged to be perpendicular to the longitudinal axis of the cylindrical ram body 11. A recess 21 is also formed in the front face of the lower wireline guide 20 and is also arranged to be perpendicular to the longitudinal axis of the cylindrical ram body 11.

[0025] The front face of a left hand half 18A of the upper wireline guide 18 extends outwardly at an angle, which may be in the region of 60°, from the junction at which the left hand half 18A meets the recess 19, and the right hand half 18B of the upper wireline guide 18 also extends outwardly at an angle, which may be in the region of 60°, from the junction at which the right hand half 18B meets the recess 19.

[0026] The front face of a left hand half 20A of the lower wireline guide 20 extends outwardly at an angle, which may be in the region of 60°, from the junction at which the left hand half 20A meets the recess 21, and the right hand half 20B of the lower wireline guide 20 also extends outwardly at an angle, which may be in the region of 60°, from the junction at which the right hand half 20B meets the recess 21.

[0027] Thus, the upper 18 and lower 20 wireline guides provide "V" shaped guiding formations which, as will be described subsequently in use, will guide a wireline into the recesses 19, 21.

[0028] An inner seal (not shown in Figs. 4(a) to 4(i) but shown in Fig. 7 as reference numeral 24) is located within the recess provided between the lowermost surface of upper wireline guide 18, uppermost face of lower wireline guide 20 and the innermost end 22. The inner seal 24 may be similar to the inner seal as shown in Figs. 1 to 3(b), and comprises a rubber inner portion bounded by two metal plates which are bonded to the rubber portion during the manufacturing process thereof. The innermost face 25 of the inner seal 24 comprises a recess (hidden in Fig. 7) which is arranged to be perpendicular to the longitudinal axis of the cylindrical ram body 11, and which is arranged to be aligned with the pair of recesses 19, 21.

[0029] It should be noted that a spacer plate 26 is located between the lowermost surface of upper wireline guide 18 and the uppermost surface of the inner seal 24. The spacer plate 26 is arranged in two halves 26A, 26B which join at intersection 26C. The leading (innermost) face of the left hand half 26A tapers at an angle, which may be in the region of 60°, from intersection point 26C toward the innermost end 22, and the leading edge (innermost surface) of the right hand half 26B of the spacer plate 26, tapers at angle, which may be in the region of 60°, from the intersection point 26C toward the innermost end 22. The vertical depth of the spacer plate 26 is substantially identical to the vertical depth of an upper wireline guide 58 of the second (left hand) ram 50, which will now be described.

[0030] Fig. 5(a) shows a second embodiment of a ram

assembly 50 in accordance with the present invention. The second ram 50 should be considered, for the sake of clarity, as the left hand side ram 50 when located in the wireline valve.

[0031] The ram 50 comprises a rear face 52, and which is formed a slot 54, the purpose of which will be detailed subsequently.

[0032] The body of the ram 50 is substantially cylindrical, and comprises a part circumferential seal slot 56 into which an outer seal (not shown in Fig. 5(a) to Fig. 5(i) but shown in Figs. 1-3(b)) is placed.

[0033] The ram 50 comprises a pair of wireline guides 58, 60 which extend outwardly from an outermost (with respect to the centre of the throughbore of the wireline valve) end 52 of the cylindrical ram body 51. The uppermost surface of the upper wireline guide 58 is planer, as is the lowermost surface of the upper wireline guide 58, with both the uppermost and lowermost surfaces of the upper wireline guide 58 being parallel to the longitudinal axis of the cylindrical ram body 51.

[0034] The lowermost surface of the lower wireline guide 60 is part circumferential, whilst the uppermost surface of the lower wireline guide 60 is planer and is parallel to the longitudinal axis of the cylindrical ram body 51.

[0035] A recess 59 is formed at the centre of the front face of the upper wireline guide 58, and the recess 59 is arranged to be perpendicular to the longitudinal axis of the cylindrical ram body 51. A recess 61 is also formed in the front face of the lower wireline guide 60 and is also arranged to be perpendicular to the longitudinal axis of the cylindrical ram body 51.

[0036] The front face of a left hand half 58A of the upper wireline guide 58 extends outwardly at an angle, which may be in the region of 60°, from the junction at which the left hand half 58A meets the recess 59, and the right hand half 58B of the upper wireline guide 58 also extends outwardly at an angle, which may be in the region of 60°, from the junction at which the right hand half 58B meets the recess 59.

[0037] The front face of a left hand half 60A of the lower wireline guide 60 extends outwardly at an angle, which may be in the region of 60°, from the junction at which the left hand half 60A meets the recess 61, and the right hand half 60B of the lower wireline guide 60 also extends outwardly at an angle, which may be in the region of 60°, from the junction at which the right hand half 60B meets the recess 61.

[0038] Thus, the upper 58 and lower 60 wireline guides provide "V" shaped guiding formations which, as will be described subsequently in use, will guide a wireline into the recesses 59, 61.

[0039] An inner seal (not shown in Figs. 5(a) to 5(i) but shown in Figs. 6 and 7 as reference numeral 64) is located within the recess provided between the lowermost surface of upper wireline guide 58, uppermost face of lower wireline guide 60 and the innermost end 62. The inner seal 64 may be similar to the inner seal as shown in Figs. 1 to 3(b), and comprises a rubber inner portion bounded by two metal plates which are screwed to the rubber portion. The innermost face of the inner seal 64 comprises a recess which is arranged to be perpendicular to the longitudinal axis of the cylindrical ram body 51, and which is arranged to be aligned with the pair of recesses 59, 61.

[0040] It should be noted that a spacer plate 66 is located between the uppermost surface of lower wireline guide 60 and the lowermost surface of the inner seal 64. The spacer plate 66 is arranged in two halves 66A, 66B which join at intersection 66C. The leading (innermost) face of the left hand half 66A tapers at an angle, which may be in the region of 60°, from intersection point 66C toward the end 62, and the leading edge (innermost surface) of the right hand half 66B of the spacer plate 66, tapers at angle, which may be in the region of 60°, from the intersection point 66C toward the end 62. The vertical depth of the spacer plate 66 is substantially identical to the vertical depth of a lower wireline guide 20 of the first (right hand) ram 10.

[0041] The pair of rams 10, 50 are placed within the pair of ram bores of the wireline valve (not shown), and in normal operation of the wireline valve, the pair of rams 10, 50 will be located in the position shown in Fig. 9 such that they are not interfering with the throughbore 70 of the wireline valve. However, when intervention is required, such that sealing around the wireline at the point at which it passes through the wireline valve throughbore 70 is required, then the pair of rams 10, 50 are pushed toward one another by respective ram rods (not shown) which are coupled to the respective rams 10, 50 by means of the respective slots 14, 54. The pair of rams 10, 50 are now approaching one another, as shown in Fig. 7 and even closer in Fig. 8. The pair of rams 10, 50 are arranged such that the lowermost surface of the upper wireline guide 18 is arranged to be in a sliding fit with the uppermost surface of the upper wireline guide 58. In addition, the left hand 58A and right hand 58B upper wireline guides of the left hand ram 50 move into the space between the lowermost surface of upper wireline guide 18 and uppermost surface of the inner seal 24. Similarly, the lowermost surface of the lower wireline guide 20 is arranged in a sliding fit with the uppermost surface of the lower wireline guide 60, and the left hand 20A and right hand 20B lower wireline guides of the right hand ram 10 move into the space between the uppermost surface of lower wireline guide 60 and lowermost surface of the inner seal 64.

[0042] It should also be noted that the outermost edges of all of the wirelines guides 18, 20, 58, 60 are of a greater width than the throughbore 70 of the wireline valve. This provides the great advantage that the wireline will be picked up by the arrangement of wireline guides 18, 20, 58, 60 and as the pair of rams 10, 50 are moved toward one another, the wireline will be guided until it is located in the recesses 19, 21, 59, 61 and in the circular recess formed between the pair of inner

seals 24, 64. It should be noted that this will occur, due to the configuration of upper 18, 58 and lower 20, 60 wireline guides no matter what position that the wireline is originally in, since the "V" shaped wireline guides 18, 20, 58, 60 are inherently configured to guide the wireline into the recesses 19, 21, 59, 61 and recesses formed in the inner seals 24, 64.

[0043] The rams 10, 50 continue move toward one another until the leading edge of the lower wireline guide 20 comes to rest against the leading edge of the spacer plate 66. Similarly, the leading edge of the upper wireline guide 58 comes to rest against the leading edge of the spacer plate 26. Similarly, the leading edge of the upper wireline guide 18 will come to rest against a "V" shaped formation 68 which is provided on the front face of the ram 50 above the upper guide 58. Similarly, the leading edge of the lower wireline guide 60 will come to rest against a "V" shaped formation 28 which is provided on the front face of the ram 10 below the lower guide 20. The provision of four guide arms 18, 20, 58, 60 provides the advantage that the wireline is denied the opportunity to touch any part of the rams 10, 50 which is not a guide arm.

[0044] Once the two rams 10, 50 have been brought together, the two outer seals, which are located in respective slots 16, 56, of the respective rams 10, 50 can be energised, thus ensuring that the pressure in the wellbore below the wireline valve is retained, and intervention work can then be carried out on the wireline protruding above the wireline valve.

[0045] Modifications and improvements may be made to the foregoing embodiments without departing from the scope of the invention. For example, although it is preferred that the wireline guides 18, 20, 58 and 60 are formed integrally with the respective cylindrical ram body, it is possible that the wireline guides 18, 20, 58 and 60 be replaceable, and in this latter scenario, suitable fixing means such as screws or bolts or the like would be used to replaceably secure the wireline guides 18, 20, 58 and 60 to the respective cylindrical ram body.

Claims

1. An apparatus (10, 50) for moving an elongate member (102) which passes through a throughbore (70; 97) of a valve device, the apparatus comprising an upper movement mechanism (18, 58) and a lower movement mechanism (20, 60) spaced apart about a portion (70) of the valve device, the upper (18, 58) and lower (20, 60) movement mechanisms being actuable such that they are capable of moving the elongate member (102) into a pre-determined position (70), **characterised in that** at least one of the upper and lower movement mechanisms (18, 58) comprises at least two pairs of guide arms (18, 58) which are adapted to move the elongate member (102) into a predetermined position.

2. An apparatus according to claim 1, wherein the predetermined position (70) is a position substantially co-incident with the longitudinal axis (70) of the valve device, such that the upper (18, 58) and lower (20, 60) movement mechanisms are respective upper (18, 58) and lower (20, 60) centralising mechanisms.

3. An apparatus according to either of claims 1 or 2, wherein at least one of the pair of guide arms (18, 58) is adapted to move the elongate member (102) toward the longitudinal axis of the valve device upon movement of the guide arms (18, 58) in a direction substantially perpendicular to the longitudinal axis of the valve device.

4. An apparatus according to any preceding claim wherein the upper movement mechanism (18, 58) comprises the at least two pairs of guide arms (18, 58).

5. An apparatus according to claim 4, wherein one pair of guide arms (18) of the upper movement mechanism (18, 58) are provided on a first ram assembly (11), and a second pair of guide arms (58) of the upper movement mechanism (18, 58) are provided on a second ram assembly (51).

6. An apparatus according to claim 5, wherein the first (11) and second (51) ram assemblies are arranged substantially diametrically opposite one another about the longitudinal axis of the throughbore (70).

7. An apparatus according to any of claims 4 to 6, wherein each of the pair of guide arms (18, 58) of the upper movement mechanism (18, 58) are arranged about a recess (19, 59) adapted to accept the elongate member (102) therein.

8. An apparatus according to either of claims 6 and 7, wherein each of the pair of guide arms (18, 58) taper outwardly at an angle from the longitudinal axis of the respective ram assembly (11, 51).

9. An apparatus according to claim 8, wherein said angle is in the region of 60° to 45°.

10. An apparatus according to either of claims 8 or 9, wherein each pair of guide arms (18, 58) of the upper movement mechanism (18, 58) taper outwardly to an extent at least as great as the diameter of the throughbore (70) of the valve device.

11. An apparatus according to any of claims 1 to 3 and 5 to 10 when not dependent upon claim 4, wherein the lower movement mechanism (20, 60) comprises the at least two pairs of said guide arms (20, 60).

12. An apparatus according to claim 11, wherein one pair (20) of guide arms (20, 60) of the lower movement mechanism (20, 60) are provided on a first ram assembly (11), and a second pair (60) of guide arms (20, 60) are provided on a second ram assembly (51).

13. An apparatus according to claim 12, wherein the first (11) and second (51) ram assemblies are arranged substantially diametrically opposite one another about the longitudinal axis of the throughbore (70).

14. An apparatus according to any of claims 11 to 13, wherein each of the pair of guide arms (20, 60) of the lower movement mechanism (20, 60) are arranged about a recess (21, 61) adapted to accept the elongate member (102) therein.

15. An apparatus according to any of claims 11 to 14, wherein each of the pair of guide arms (20, 60) taper outwardly at an angle from the longitudinal axis of the respective ram assembly (11, 51).

16. An apparatus according to claim 15, wherein said angle is in the region of 60° to 45°.

17. An apparatus according to either of claims 15 or 16, wherein each pair of guide arms (20, 60) of the lower movement mechanism (20, 60) taper outwardly to an extent at least as great as the diameter of the throughbore (70) of the valve device.

18. An apparatus according to claim 5 or to any of claims 6 to 17 when dependent upon claim 5, wherein the pair of guide arms (18) of the upper movement mechanism (18, 58) of one of the ram assemblies (11) is arranged to butt against a portion of the pair of guide arms (58) of the upper movement mechanism (18, 58) of the other of the ram assemblies (51).

19. An apparatus according to claim 5 or to any of claims 6 to 18 when dependent upon claim 5, wherein a surface of the pair of guide arms (18) of the upper movement mechanism (18, 58) of one of the ram assemblies (11) is arranged to be a sliding fit with a surface of the pair of guide arms (58) of the upper movement mechanism (18, 58) of the other of the ram assemblies (51).

20. An apparatus according to claim 11 or to any of claims 12 to 19 when dependent upon claim 11, wherein the pair of guide arms (20) of the lower movement mechanism (20, 60) of one of the ram assemblies (11) is arranged to butt against a portion of the pair of guide arms (60) of the lower movement mechanism (20, 60) of the other of the ram assemblies (51).

21. An apparatus according to claim 11 or to any of claims 12 to 20 when dependent upon claim 11, wherein a surface of the pair of guide arms (20) of the lower movement mechanism (20, 60) of one of the ram assemblies (11) is arranged to be a sliding fit with a surface of the pair of guide arms (60) of the lower movement mechanism (20, 60) of the other of the ram assemblies (51).

22. An apparatus according to claim 14 when dependent upon claim 7, wherein the recesses (19, 59) of the upper movement mechanism (18, 58) and the recesses (21, 61) of the lower movement mechanism (20, 60) are arranged to be coincident with the longitudinal axis of a recess of an inner sealing member (24, 64) of the valve device.

23. An apparatus according to either of claims 5 or 12, wherein each of the pair of ram assemblies (11, 51) comprises an upper (18, 58) and lower movement mechanism (20, 60).

24. An apparatus according to claim 23, wherein the upper (18, 58) and lower (20, 60) movement mechanisms are located immediately about an inner sealing member (24, 64) of the wireline valve.

25. An apparatus according to claim 2, wherein the upper (18, 58) and lower (20, 60) centralising mechanisms are provided within a member having a substantially cylindrical throughbore (70), wherein the respective members are adapted for coupling to the upper end of the valve device.

26. A method of moving an elongate member (102) which passes through a throughbore (70) of a valve device, the method comprising providing an upper movement mechanism (18, 58) and a lower movement mechanism (20, 60) spaced apart about a portion of the valve device, **characterised in that** at least one of the upper (18, 58) and lower (20, 60) movement mechanisms being provided with at least two pairs of guide arms such that actuation of at least one of the upper (18, 58) and lower (20, 60) movement mechanism moves the elongate member (102) into a pre-determined position.

27. A valve device comprising an apparatus according to any of claims 1 to 25.

Patentansprüche

1. Eine Vorrichtung (10, 50) zum Bewegen eines verlängerten Elements (102), das durch eine Durchgangsbohrung (70; 97) einer Ventileinrichtung ver-

läuft, wobei die Vorrichtung einen oberen Bewegungsmechanismus (18, 58) und einen unteren Bewegungsmechanismus (20, 60), die um einen Abschnitt (70) der Ventileinrichtung mit Abstand angeordnet sind, beinhaltet, wobei der obere (18, 58) und untere (20, 60) Bewegungsmechanismus betätigbar sind, so dass sie das verlängerte Element (102) in eine vorbestimmte Position (70) bewegen können, **dadurch gekennzeichnet, dass** mindestens einer der oberen und unteren Bewegungsmechanismen (18, 58) mindestens zwei Paare Führungsarme (18, 58) beinhaltet, die ausgeführt sind, um das verlängerte Element (102) in eine vorbestimmte Position zu bewegen.

2. Vorrichtung gemäß Anspruch 1, wobei die vorbestimmte Position (70) eine Position ist, die im Wesentlichen mit der Längsachse (70) der Ventileinrichtung übereinstimmt, so dass die oberen (18, 58) und unteren (20, 60) Bewegungsmechanismen entsprechende obere (18, 58) und untere (20, 60) Zentralisierungsmechanismen sind.

3. Vorrichtung gemäß Anspruch 1 oder 2, wobei mindestens eines der Paare Führungsarme (18, 58) ausgeführt ist, um das verlängerte Element (102) in Richtung der Längsachse der Ventileinrichtung bei Bewegung der Führungsarme (18, 58) in eine im Wesentlichen senkrechte Richtung zu der Längsachse der Ventileinrichtung zu bewegen.

4. Vorrichtung gemäß einem der vorhergehenden Ansprüche, wobei der obere Bewegungsmechanismus (18, 58) die mindestens zwei Paare Führungsarme (18, 58) beinhaltet.

5. Vorrichtung gemäß Anspruch 4, wobei ein Paar Führungsarme (18) des oberen Bewegungsmechanismus (18, 58) auf einer ersten Stößelanordnung (11) bereitgestellt ist, und ein zweites Paar Führungsarme (58) des oberen Bewegungsmechanismus (18, 58) auf einer zweiten Stößelanordnung (51) bereitgestellt ist.

6. Vorrichtung gemäß Anspruch 5, wobei die erste (11) und zweite (51) Stößelanordnung im Wesentlichen diametral einander gegenüberliegend um die Längsachse der Durchgangsbohrung (70) angeordnet sind.

7. Vorrichtung gemäß einem der Ansprüche 4 bis 6, wobei jedes der Paar Führungsarme (18, 58) des oberen Bewegungsmechanismus (18, 58) um eine Aussparung (19, 59), die ausgeführt ist, um das verlängerte Element (102) darin anzunehmen, angeordnet ist.

8. Vorrichtung gemäß Anspruch 6 oder 7, wobei sich jedes der Paare Führungsarme nach außen (18, 58) in einem Winkel von der Längsachse der entsprechenden Stößelanordnung (11, 51) zuspitzt.

9. Vorrichtung gemäß Anspruch 8, wobei sich der Winkel im Bereich zwischen 60° bis 45° befindet.

10. Vorrichtung gemäß Anspruch 8 oder 9, wobei sich jedes Paar Führungsarme (18, 58) des oberen Bewegungsmechanismus (18, 58) nach außen in einem Ausmaß mindestens so groß wie der Durchmesser der Durchgangsbohrung (70) der Ventileinrichtung zuspitzt.

11. Vorrichtung gemäß einem der Ansprüche 1 bis 3 und 5 bis 10, wenn nicht abhängig von Anspruch 4, wobei der untere Bewegungsmechanismus (20, 60) die mindestens zwei Paare Führungsarme (20, 60) beinhaltet.

12. Vorrichtung gemäß Anspruch 11, wobei ein Paar (20) Führungsarme (20, 60) des unteren Bewegungsmechanismus (20, 60) auf einer ersten Stößelanordnung (11) bereitgestellt ist, und ein zweites Paar (60) Führungsarme (20, 60) auf einer zweiten Stößelanordnung (51) bereitgestellt ist.

13. Vorrichtung gemäß Anspruch 12, wobei die erste (11) und zweite (51) Stößelanordnung im Wesentlichen diametral einander gegenüberliegend um die Längsachse der Durchgangsbohrung (70) angeordnet sind.

14. Vorrichtung gemäß einem der Ansprüche 11 bis 13, wobei jedes der Paare Führungsarme (20, 60) des unteren Bewegungsmechanismus (20, 60) um eine Aussparung (21, 61), die ausgeführt ist, um das verlängerte Element (102) darin anzunehmen, angeordnet ist.

15. Vorrichtung gemäß einem der Ansprüche 11 bis 14, wobei sich jedes der Paare Führungsarme (20, 60) in einem Winkel von der Längsachse der entsprechenden Stößelanordnung (11, 51) zuspitzt.

16. Vorrichtung gemäß Anspruch 15, wobei sich der Winkel im Bereich zwischen 60° bis 45° befindet.

17. Vorrichtung gemäß Anspruch 15 oder 16, wobei sich jedes Paar Führungsarme (20, 60) des unteren Bewegungsmechanismus (20, 60) nach außen in einem Ausmaß mindestens so groß wie der Durchmesser der Durchgangsbohrung (70) der Ventileinrichtung zuspitzt.

18. Vorrichtung gemäß Anspruch 5 oder einem der Ansprüche 6 bis 17, wenn abhängig von Anspruch 5, wobei das Paar Führungsarme (18) des oberen Be-

wegungsmechanismus (18, 58) von einer der Stößelanordnungen (11) angeordnet ist, um gegen einen Abschnitt des Paars Führungsarme (58) des oberen Bewegungsmechanismus (18, 58) der anderen Stößelanordnung (51) zu stoßen.

19. Vorrichtung gemäß Anspruch 5 oder einem der Ansprüche 6 bis 18, wenn abhängig von Anspruch 5, wobei eine Fläche des Paars Führungsarme (18) des oberen Bewegungsmechanismus (18, 58) von einer der Stößelanordnungen (11) angeordnet ist, um ein Gleitsitz mit einer Fläche des Paars Führungsarme (58) des oberen Bewegungsmechanismus (18, 58) der anderen Stößelanordnung (51) zu sein.

20. Vorrichtung gemäß Anspruch 11 oder einem der Ansprüche 12 bis 19, wenn abhängig von Anspruch 11, wobei das Paar Führungsarme (20) des unteren Bewegungsmechanismus (20, 60) von einer der Stößelanordnungen (11) angeordnet ist, um gegen einen Abschnitt des Paars Führungsarme (60) des unteren Bewegungsmechanismus (20, 60) der anderen Stößelanordnung (51) zu stoßen.

21. Vorrichtung gemäß Anspruch 11 oder einem der Ansprüche 12 bis 20, wenn abhängig von Anspruch 11, wobei eine Fläche des Paares Führungsarme (20) des unteren Bewegungsmechanismus (20, 60) von einer der Stößelanordnungen (11) angeordnet ist, um ein Gleitsitz mit einer Fläche des Paars Führungsarme (60) des unteren Bewegungsmechanismus (20, 60) der anderen Stößelanordnung (51) zu sein.

22. Vorrichtung gemäß Anspruch 14 wenn abhängig von Anspruch 7, wobei die Aussparungen (19, 59) des oberen Bewegungsmechanismus (18, 58) und der Aussparungen (21, 61) des unteren Bewegungsmechanismus (20, 60) angeordnet sind, um mit der Längsachse einer Aussparung eines inneren Dichtungselements (24, 64) der Ventileinrichtung übereinzustimmen.

23. Vorrichtung gemäß einem der Ansprüche 5 oder 12, wobei jedes der Paare Stößelanordnungen (11, 51) einen oberen (18, 58) und unteren Bewegungsmechanismus (20, 60) beinhaltet.

24. Vorrichtung gemäß Anspruch 23, wobei sich die oberen (18, 58) und unteren (20, 60) Bewegungsmechanismen unmittelbar um ein inneres Dichtungselement (24, 64) des Drahtventils befinden.

25. Vorrichtung gemäß Anspruch 2, wobei die oberen (18, 58) und unteren (20, 60) Zentralisierungsmechanismen innerhalb eines Elements bereitgestellt sind, das eine im Wesentlichen zylindrische Durchgangsbohrung (70) aufweist, wobei die entsprechenden Elemente zum Koppeln an das obere Ende der Ventileinrichtung ausgeführt sind.

26. Ein Verfahren zum Bewegen eines verlängerten Elements (102), das durch eine Durchgangsbohrung (70) einer Ventileinrichtung verläuft, wobei das Verfahren das Bereitstellen eines oberen Bewegungsmechanismus (18, 58) und eines unteren Bewegungsmechanismus (20, 60), die um einen Abschnitt der Ventileinrichtung mit Abstand angeordnet sind, beinhaltet, **dadurch gekennzeichnet, dass** mindestens einer der oberen (18, 58) und unteren (20, 60) Bewegungsmechanismen mit mindestens zwei Paaren Führungsarmen versehen ist, so dass die Betätigung von mindestens einem der oberen (18, 58) und unteren (20, 60) Bewegungsmechanismen das verlängerte Element (102) in eine vorbestimmte Position bewegt.

27. Eine Ventileinrichtung, die eine Vorrichtung gemäß einem der Ansprüche 1 bis 25 beinhaltet.

Revendications

1. Un appareil (10, 50) destiné à déplacer un élément allongé (102) qui traverse un alésage débouchant (70 ; 97) d'un dispositif de soupape, l'appareil comportant un mécanisme de déplacement supérieur (18, 58) et un mécanisme de déplacement inférieur (20, 60) espacés autour d'une portion (70) du dispositif de soupape, les mécanismes de déplacement supérieur (18, 58) et inférieur (20, 60) pouvant être actionnés de telle sorte qu'ils soient capables de déplacer l'élément allongé (102) jusque dans une position prédéterminée (70), **caractérisé en ce qu'**au moins un des mécanismes de déplacement supérieur et inférieur (18, 58) comporte au moins deux paires de bras de guidage (18, 58) qui sont adaptés pour déplacer l'élément allongé (102) jusque dans une position prédéterminée.

2. Un appareil selon la revendication 1, dans lequel la position prédéterminée (70) est une position coïncidant substantiellement avec l'axe longitudinal (70) du dispositif de soupape, de telle sorte que les mécanismes de déplacement supérieur (18, 58) et inférieur (20, 60) sont des mécanismes de centrage supérieur (18, 58) et inférieur (20, 60) respectifs.

3. Un appareil selon l'une ou l'autre des revendications 1 et 2, dans lequel au moins un bras de la paire de bras de guidage (18, 58) est adapté pour déplacer l'élément allongé (102) en direction de l'axe longitudinal du dispositif de soupape lors du déplacement des bras de guidage (18, 58) dans un sens substantiellement perpendiculaire à l'axe longitudi-

nal du dispositif de soupape.

4. Un appareil selon n'importe quelle revendication précédente dans lequel le mécanisme de déplacement supérieur (18, 58) comporte ces au moins deux paires de bras de guidage (18, 58).

5. Un appareil selon la revendication 4, dans lequel une paire de bras de guidage (18) du mécanisme de déplacement supérieur (18, 58) sont fournis sur un premier assemblage à coulisseau (11), et une deuxième paire de bras de guidage (58) du mécanisme de déplacement supérieur (18, 58) sont fournis sur un deuxième assemblage à coulisseau (51).

6. Un appareil selon la revendication 5, dans lequel les premier (11) et deuxième (51) assemblages à coulisseau sont agencés de façon substantiellement diamétralement opposée l'un par rapport à l'autre autour de l'axe longitudinal de l'alésage débouchant (70).

7. Un appareil selon n'importe lesquelles des revendications 4 à 6, dans lequel chaque bras de la paire de bras de guidage (18, 58) du mécanisme de déplacement supérieur (18, 58) est agencé autour d'un renfoncement (19, 59) adapté pour y accueillir l'élément allongé (102).

8. Un appareil selon l'une ou l'autre des revendications 6 et 7, dans lequel chaque bras de la paire de bras de guidage (18, 58) s'effile vers l'extérieur en angle en partant de l'axe longitudinal de l'assemblage à coulisseau respectif (11, 51).

9. Un appareil selon la revendication 8, dans lequel ledit angle est dans la gamme allant de 60° à 45°.

10. Un appareil selon l'une ou l'autre des revendications 8 et 9, dans lequel chaque paire de bras de guidage (18, 58) du mécanisme de déplacement supérieur (18, 58) s'effile vers l'extérieur d'au moins autant que le diamètre de l'alésage débouchant (70) du dispositif de soupape.

11. Un appareil selon n'importe lesquelles des revendications 1 à 3 et 5 à 10 lorsqu'elles ne dépendent pas de la revendication 4, dans lequel le mécanisme de déplacement inférieur (20, 60) comporte ces au moins deux paires de dits bras de guidage (20, 60).

12. Un appareil selon la revendication 11, dans lequel une paire (20) de bras de guidage (20, 60) du mécanisme de déplacement inférieur (20, 60) sont fournis sur un premier assemblage à coulisseau (11), et une deuxième paire (60) de bras de guidage (20, 60) sont fournis sur un deuxième assemblage à coulisseau (51).

13. Un appareil selon la revendication 12, dans lequel les premier (11) et deuxième (51) assemblages à coulisseau sont agencés de façon substantiellement diamétralement opposée l'un par rapport à l'autre autour de l'axe longitudinal de l'alésage débouchant (70).

14. Un appareil selon n'importe lesquelles des revendications 11 à 13, dans lequel chaque bras de la paire de bras de guidage (20, 60) du mécanisme de déplacement inférieur (20, 60) est agencé autour d'un renfoncement (21, 61) adapté pour y accueillir l'élément allongé (102).

15. Un appareil selon n'importe lesquelles des revendications 11 à 14, dans lequel chaque bras de la paire de bras de guidage (20, 60) s'effile vers l'extérieur en angle en partant de l'axe longitudinal de l'assemblage à coulisseau respectif (11, 51).

16. Un appareil selon la revendication 15, dans lequel ledit angle est dans la gamme allant de 60° à 45°.

17. Un appareil selon l'une ou l'autre des revendications 15 et 16, dans lequel chaque paire de bras de guidage (20, 60) du mécanisme de déplacement inférieur (20, 60) s'effile vers l'extérieur d'au moins autant que le diamètre de l'alésage débouchant (70) du dispositif de soupape.

18. Un appareil selon la revendication 5 ou n'importe lesquelles des revendications 6 à 17 lorsqu'elles dépendent de la revendication 5, dans lequel la paire de bras de guidage (18) du mécanisme de déplacement supérieur (18, 58) d'un des assemblages à coulisseau (11) est agencée pour s'abouter contre une portion de la paire de bras de guidage (58) du mécanisme de déplacement supérieur (18, 58) de l'autre des assemblages à coulisseau (51).

19. Un appareil selon la revendication 5 ou n'importe lesquelles des revendications 6 à 18 lorsqu'elles dépendent de la revendication 5, dans lequel une surface de la paire de bras de guidage (18) du mécanisme de déplacement supérieur (18, 58) d'un des assemblages à coulisseau (11) est agencée pour s'emboîter en coulissant avec une surface de la paire de bras de guidage (58) du mécanisme de déplacement supérieur (18, 58) de l'autre des assemblages à coulisseau (51).

20. Un appareil selon la revendication 11 ou n'importe lesquelles des revendications 12 à 19 lorsqu'elles dépendent de la revendication 11, dans lequel la paire de bras de guidage (20) du mécanisme de déplacement inférieur (20, 60) d'un des assemblages

à coulisseau (11) est agencée pour s'abouter contre une portion de la paire de bras de guidage (60) du mécanisme de déplacement inférieur (20, 60) de l'autre des assemblages à coulisseau (51).

21. Un appareil selon la revendication 11 ou n'importe lesquelles des revendications 12 à 20 lorsqu'elles dépendent de la revendication 11, dans lequel une surface de la paire de bras de guidage (20) du mécanisme de déplacement inférieur (20, 60) d'un des assemblages à coulisseau (11) est agencée pour s'emboîter en coulissant avec une surface de la paire de bras de guidage (60) du mécanisme de déplacement inférieur (20, 60) de l'autre des assemblages à coulisseau (51).

22. Un appareil selon la revendication 14 lorsqu'elle dépend de la revendication 7, dans lequel les renfoncements (19, 59) du mécanisme de déplacement supérieur (18, 58) et les renfoncements (21, 61) du mécanisme de déplacement inférieur (20, 60) sont agencés pour coïncider avec l'axe longitudinal d'un renfoncement d'un élément de scellement interne (24, 64) du dispositif de soupape.

23. Un appareil selon l'une ou l'autre des revendications 5 et 12, dans lequel chaque assemblage de la paire d'assemblages à coulisseau (11, 51) comporte des mécanismes de déplacement supérieur (18, 58) et inférieur (20, 60).

24. Un appareil selon la revendication 23, dans lequel les mécanismes de déplacement supérieur (18, 58) et inférieur (20, 60) sont situés immédiatement autour d'un élément de scellement interne (24, 64) de la soupape de câble métallique.

25. Un appareil selon la revendication 2, dans lequel les mécanismes de centrage supérieur (18, 58) et inférieur (20, 60) sont fournis à l'intérieur d'un élément ayant un alésage débouchant substantiellement cylindrique (70), dans lequel les éléments respectifs sont adaptés pour être couplés à l'extrémité supérieure du dispositif de soupape.

26. Un procédé de déplacement d'un élément allongé (102) qui traverse un alésage débouchant (70) d'un dispositif de soupape, le procédé comportant la fourniture d'un mécanisme de déplacement supérieur (18, 58) et d'un mécanisme de déplacement inférieur (20, 60) espacés autour d'une portion du dispositif de soupape, **caractérisé en ce qu'**au moins un mécanisme parmi les mécanismes de déplacement supérieur (18, 58) et inférieur (20, 60) est muni d'au moins deux paires de bras de guidage de telle sorte que l'actionnement d'au moins un mécanisme parmi les mécanismes de déplacement supérieur (18, 58) et inférieur (20, 60) fasse se déplacer l'élément allongé (102) jusque dans une position prédéterminée.

27. Un dispositif de soupape comportant un appareil selon n'importe lesquelles des revendications 1 à 25.

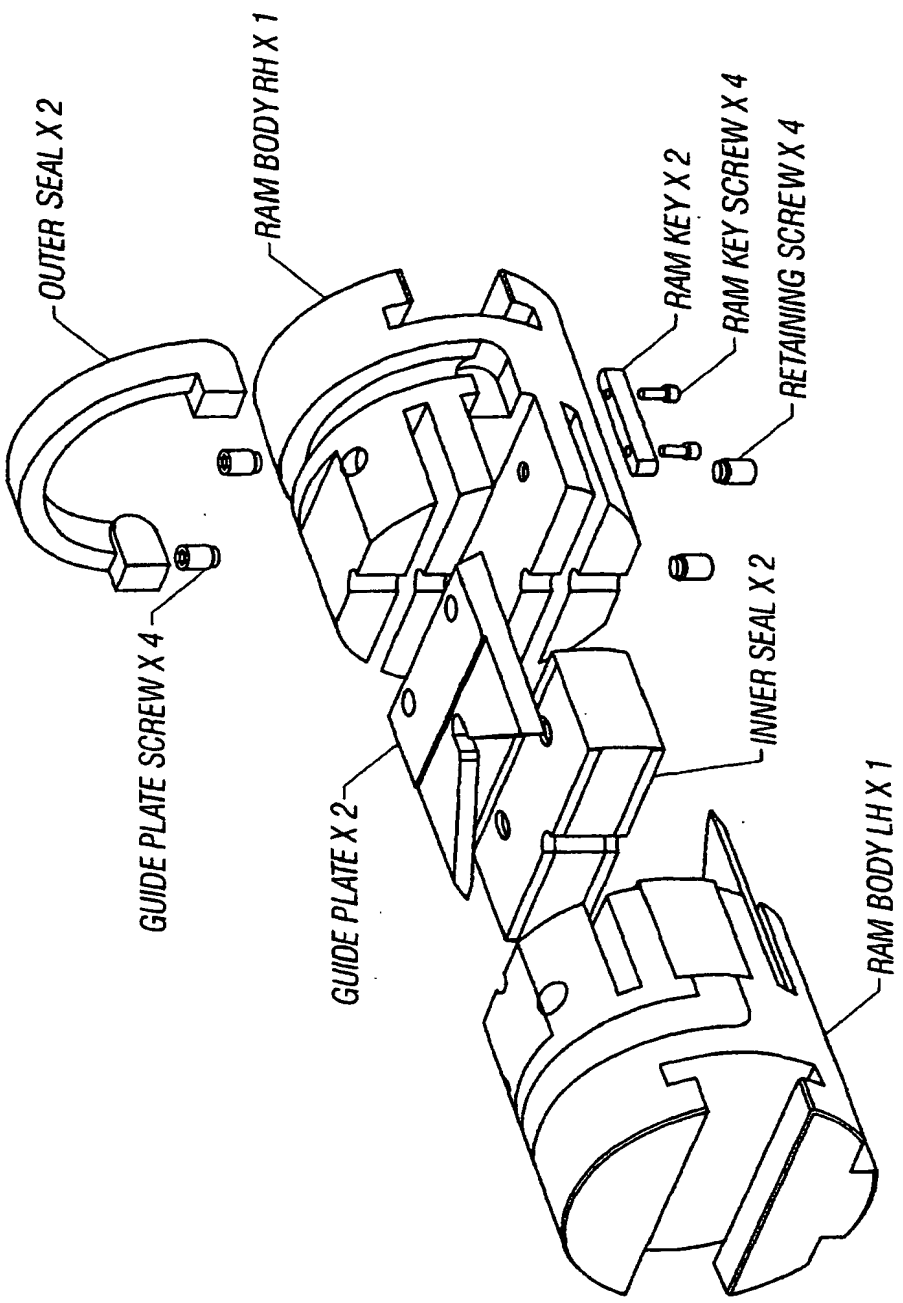


FIG. 1
(Prior Art)

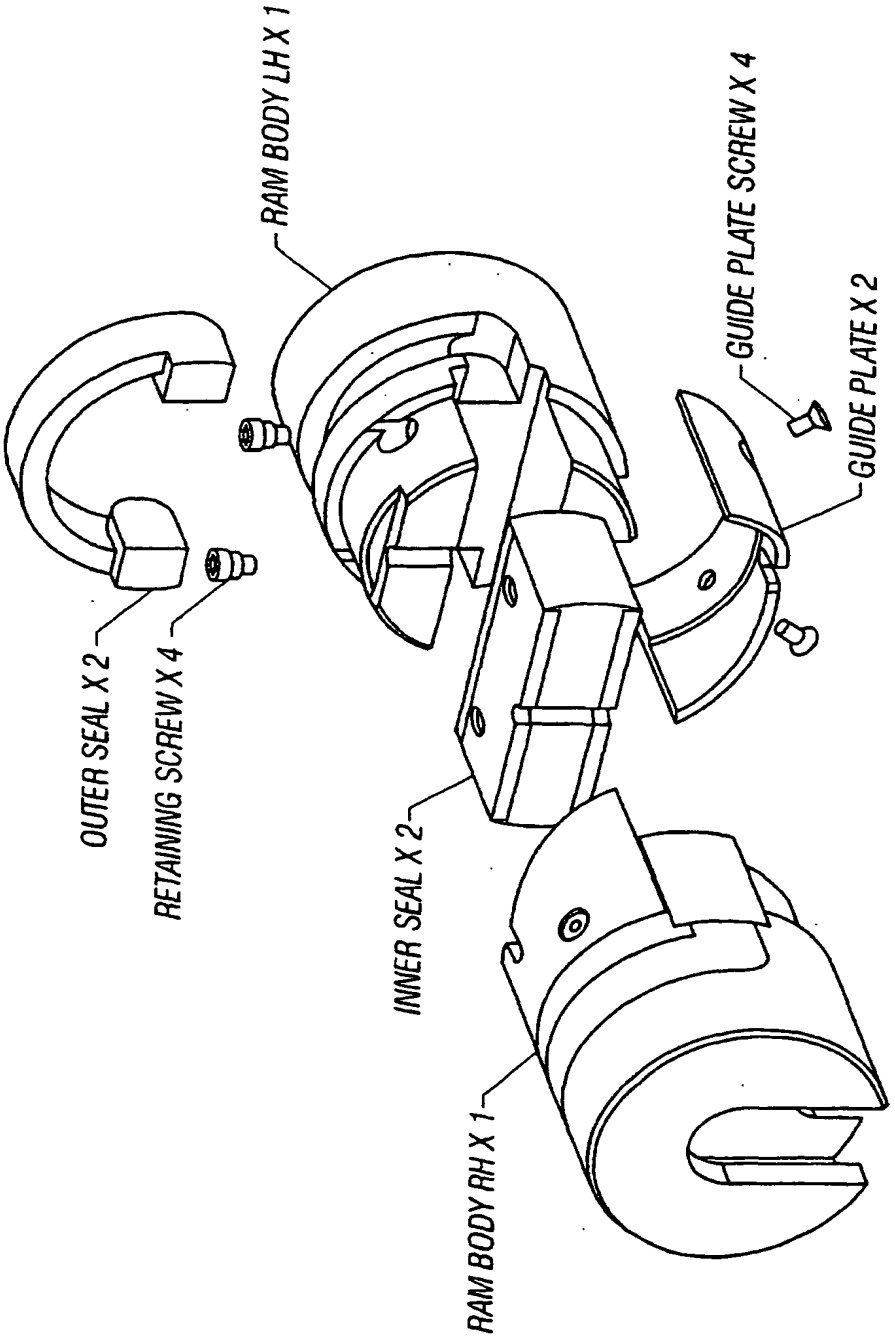


FIG. 2
(Prior Art)

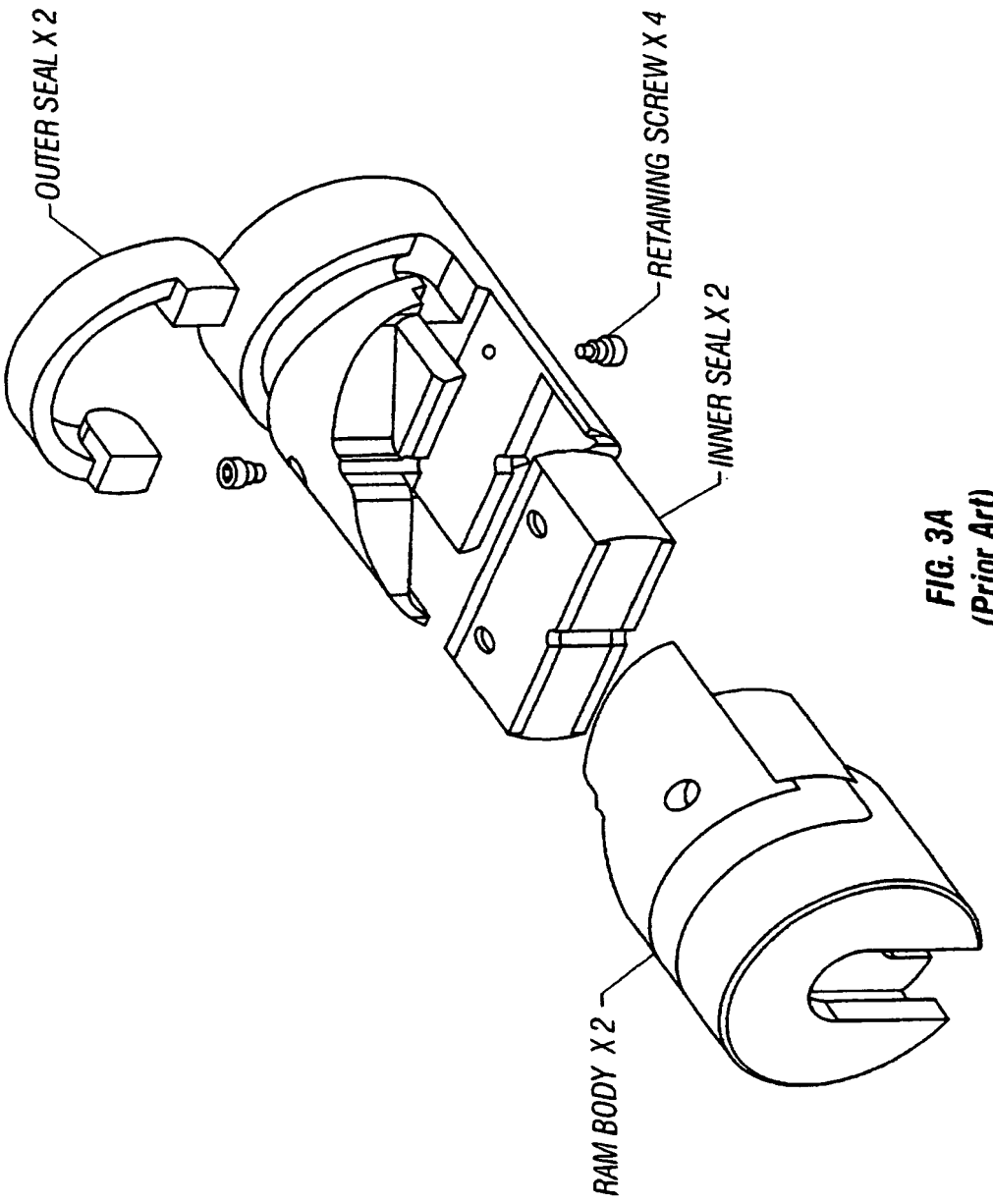


FIG. 3A
(Prior Art)

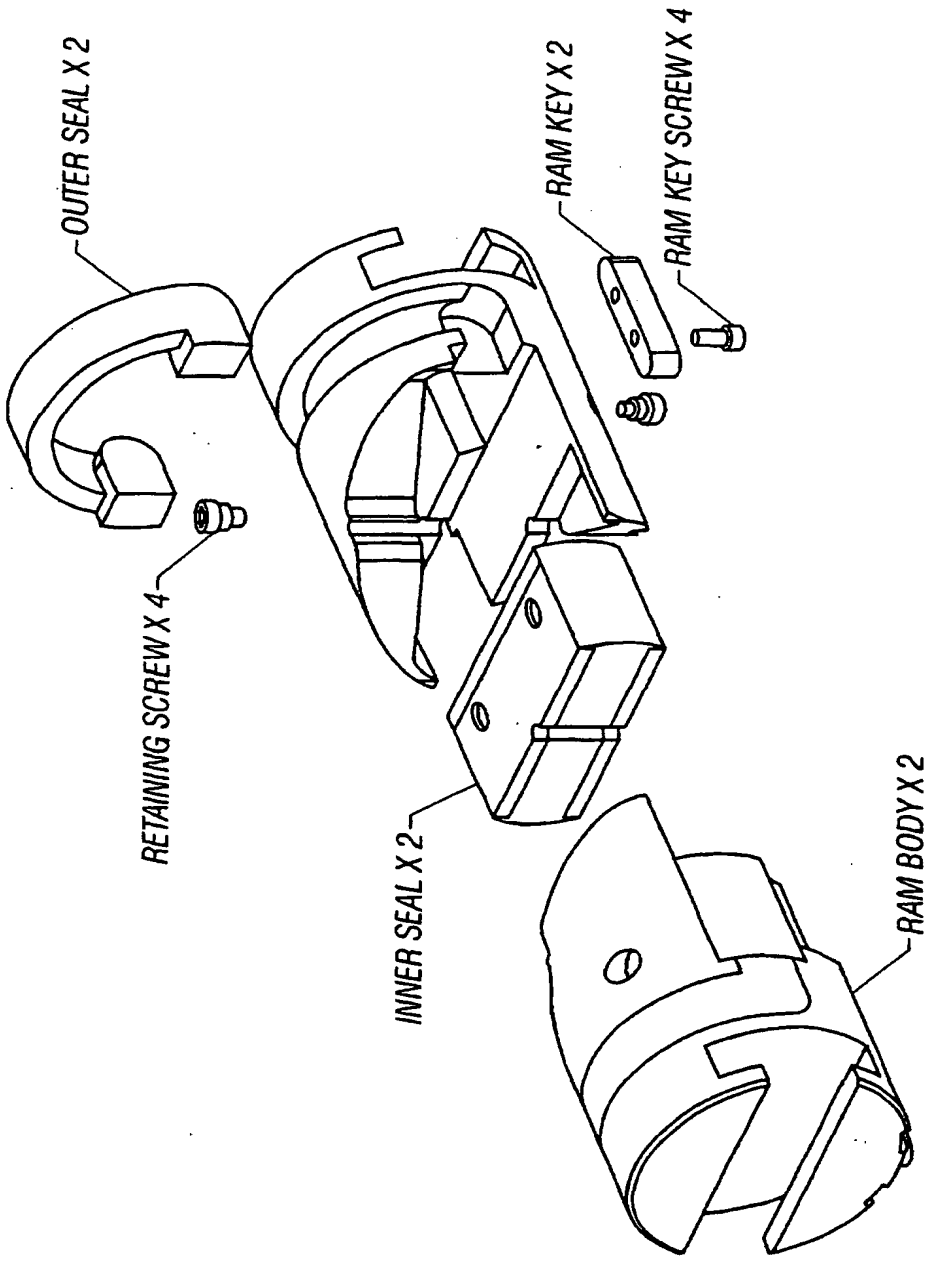


FIG. 3B
(Prior Art)

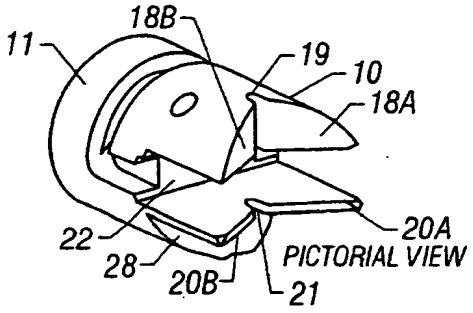


FIG. 4A

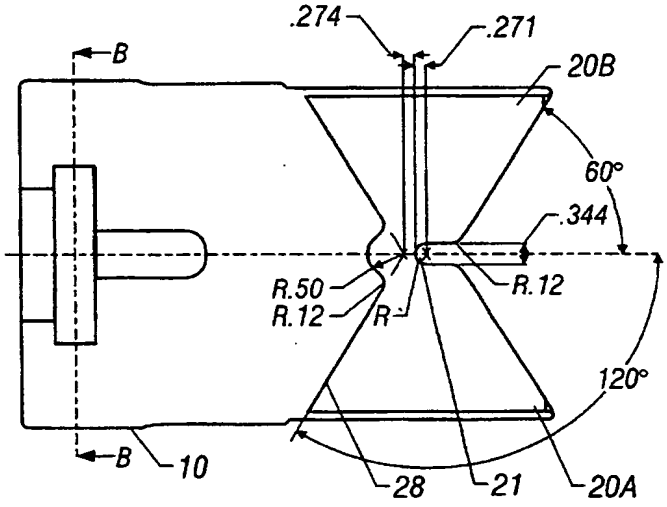


FIG. 4B

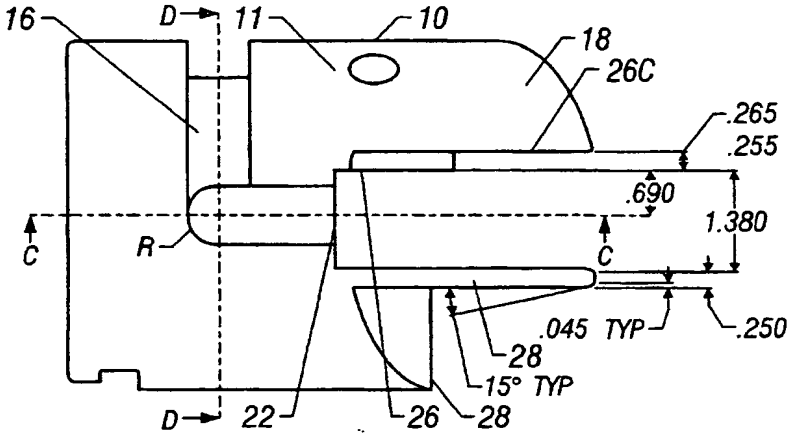


FIG. 4C

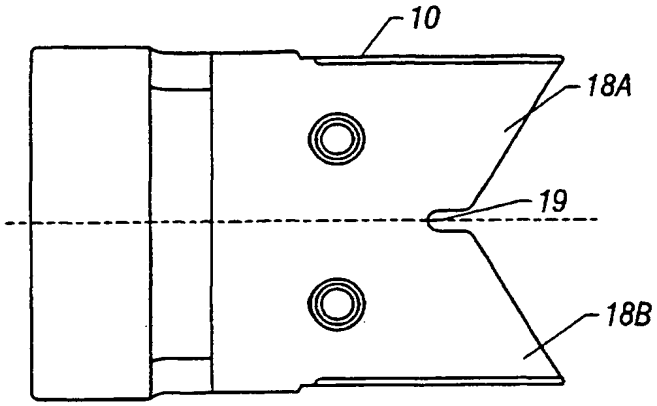


FIG. 4D

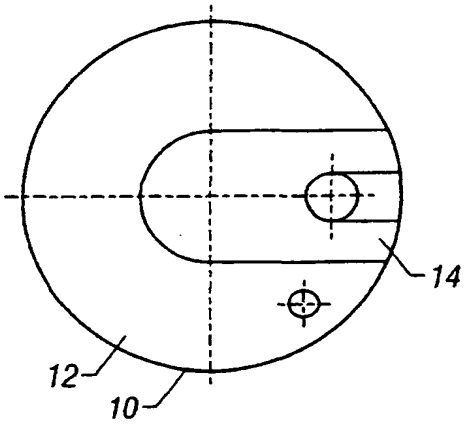
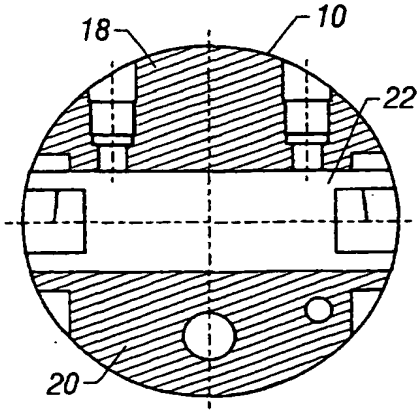


FIG. 4E



SECTION A-A

FIG. 4F

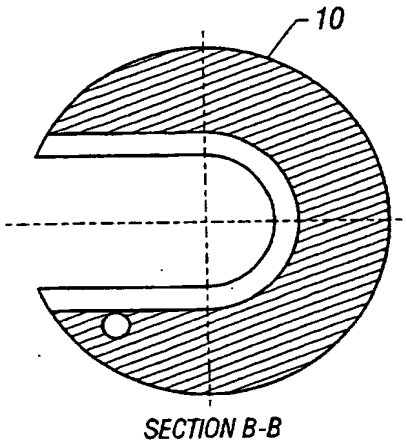


FIG. 4G

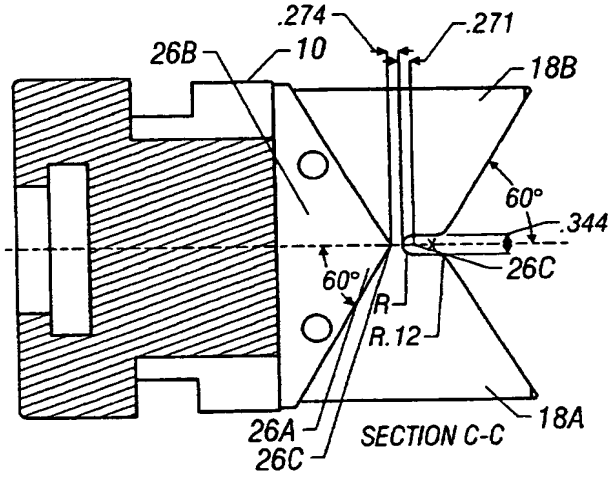


FIG. 4H

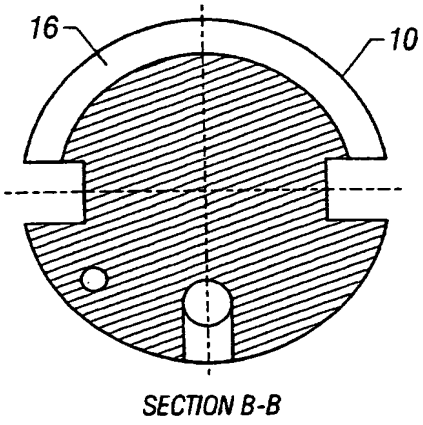


FIG. 4I

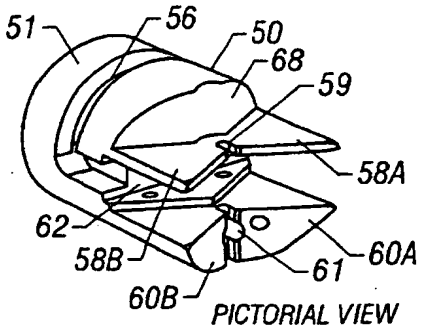


FIG. 5A

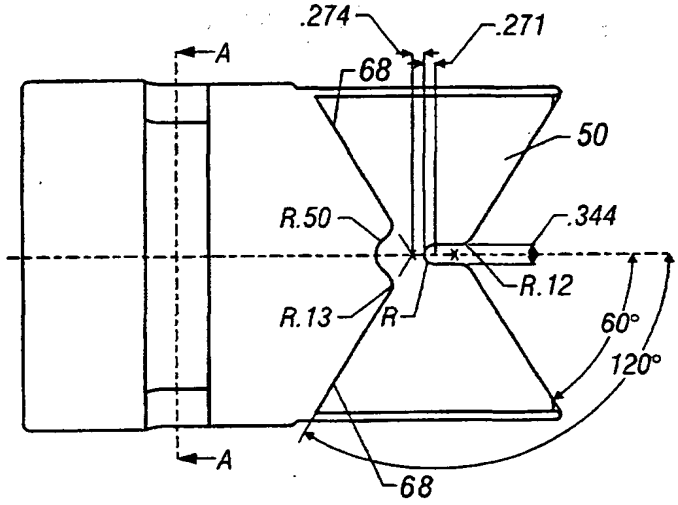


FIG. 5B

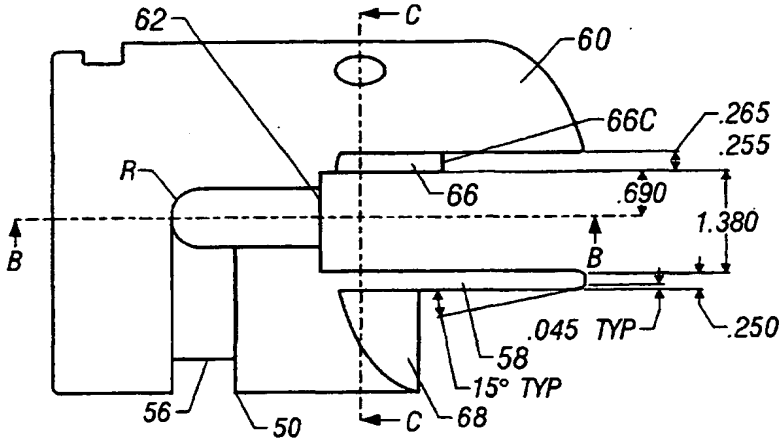


FIG. 5C

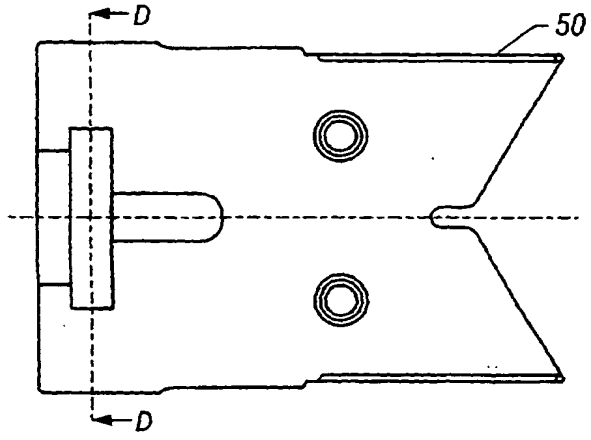


FIG. 5D

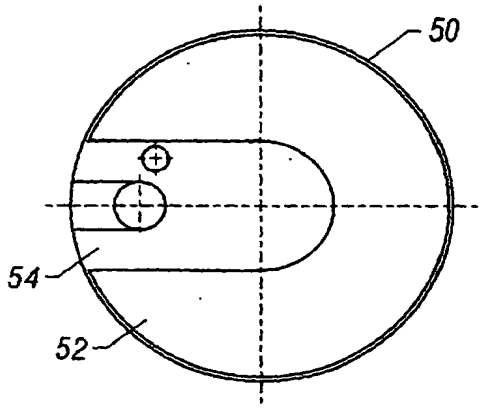


FIG. 5E

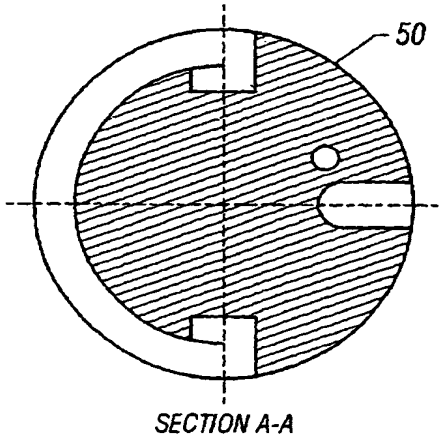


FIG. 5F

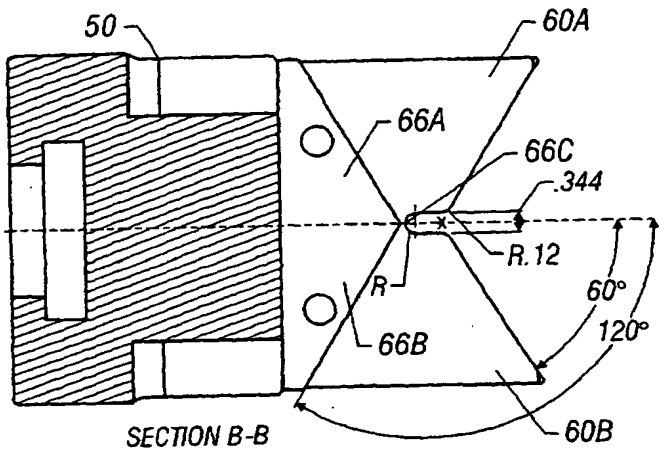


FIG. 5G

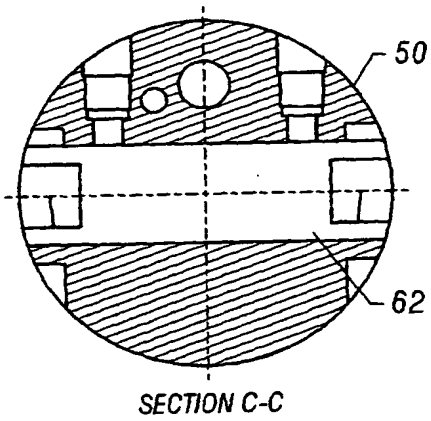


FIG. 5H

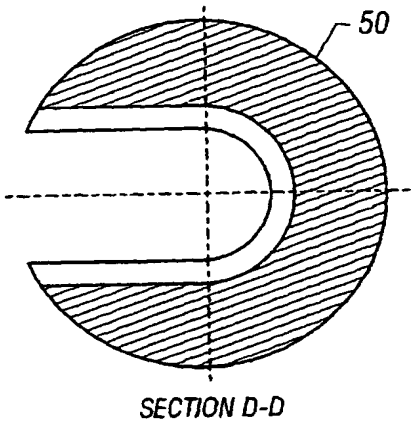


FIG. 5I

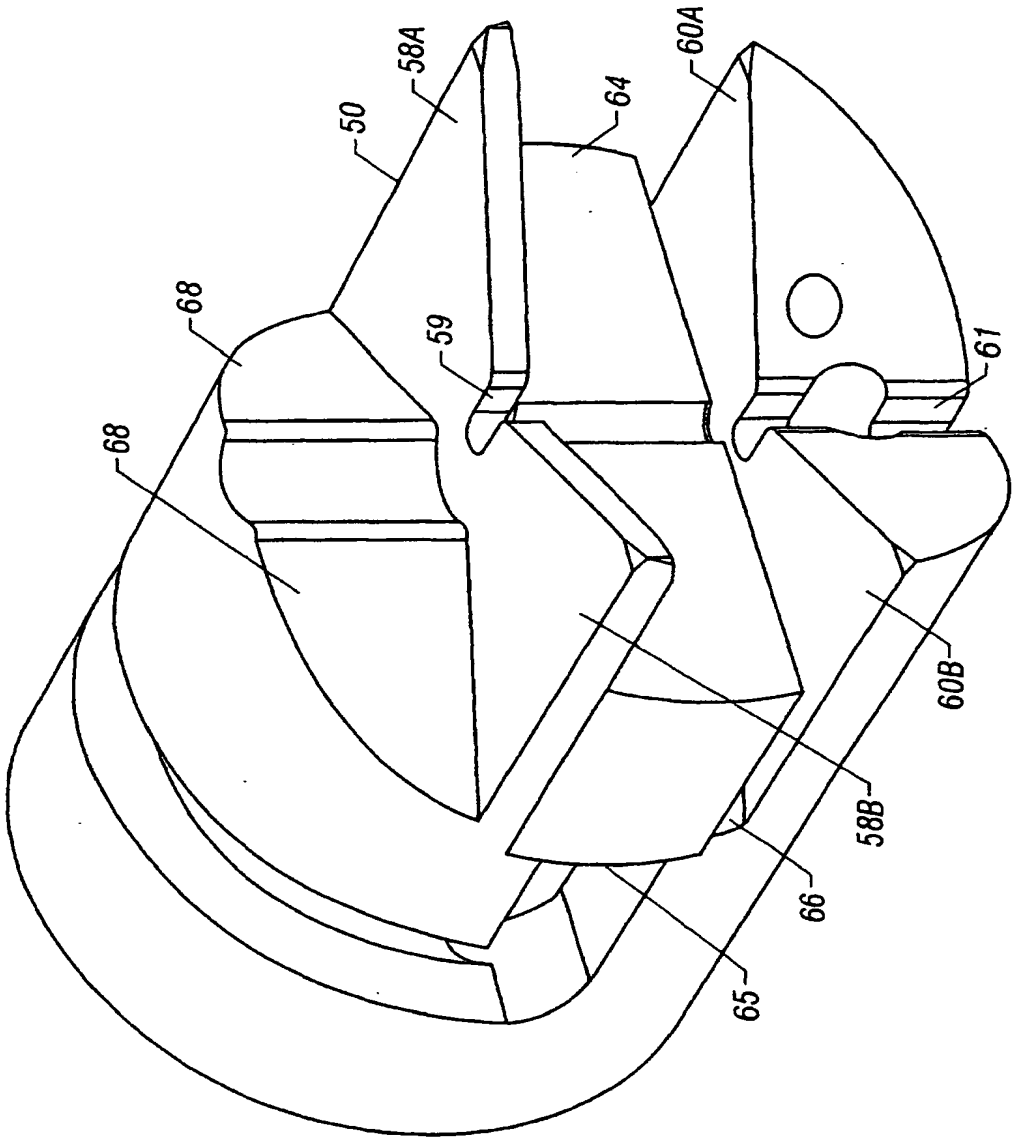


FIG. 6

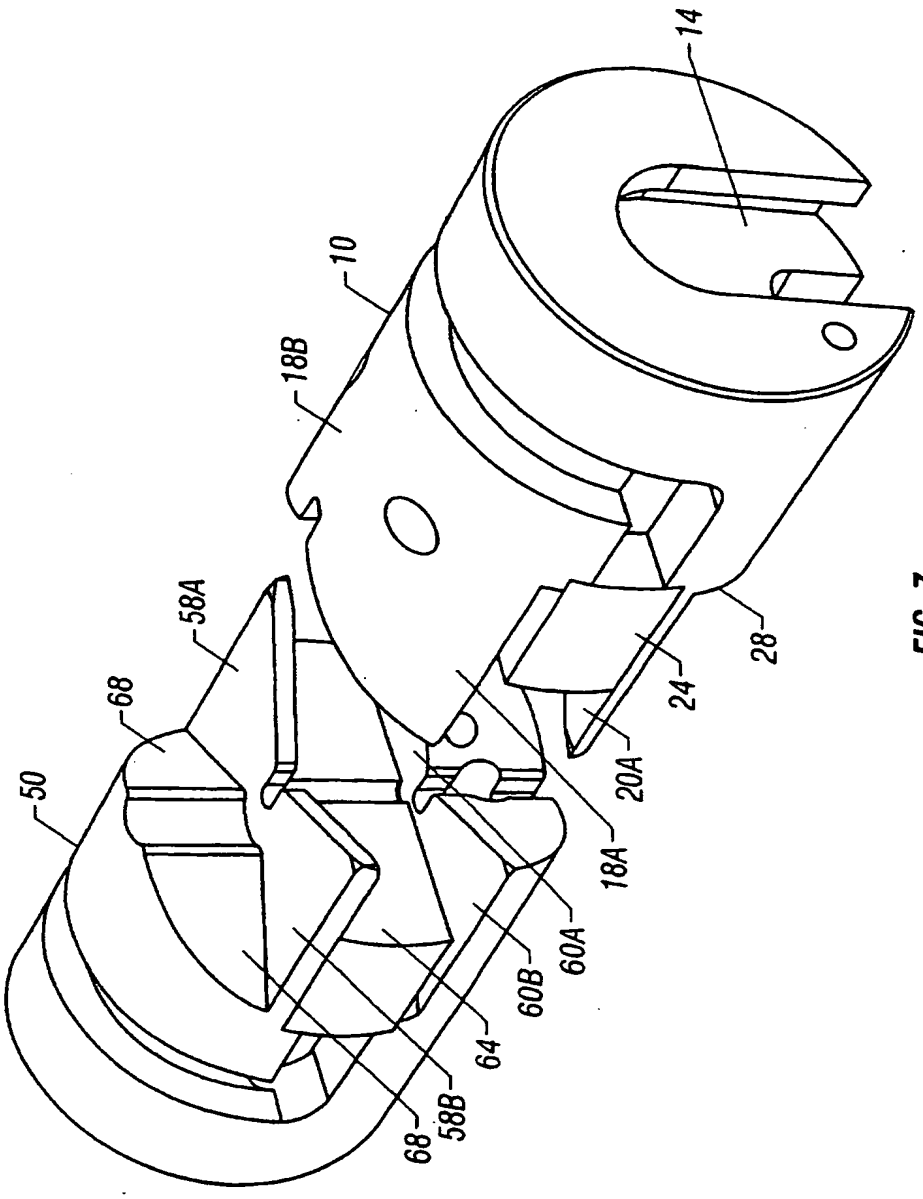


FIG. 7

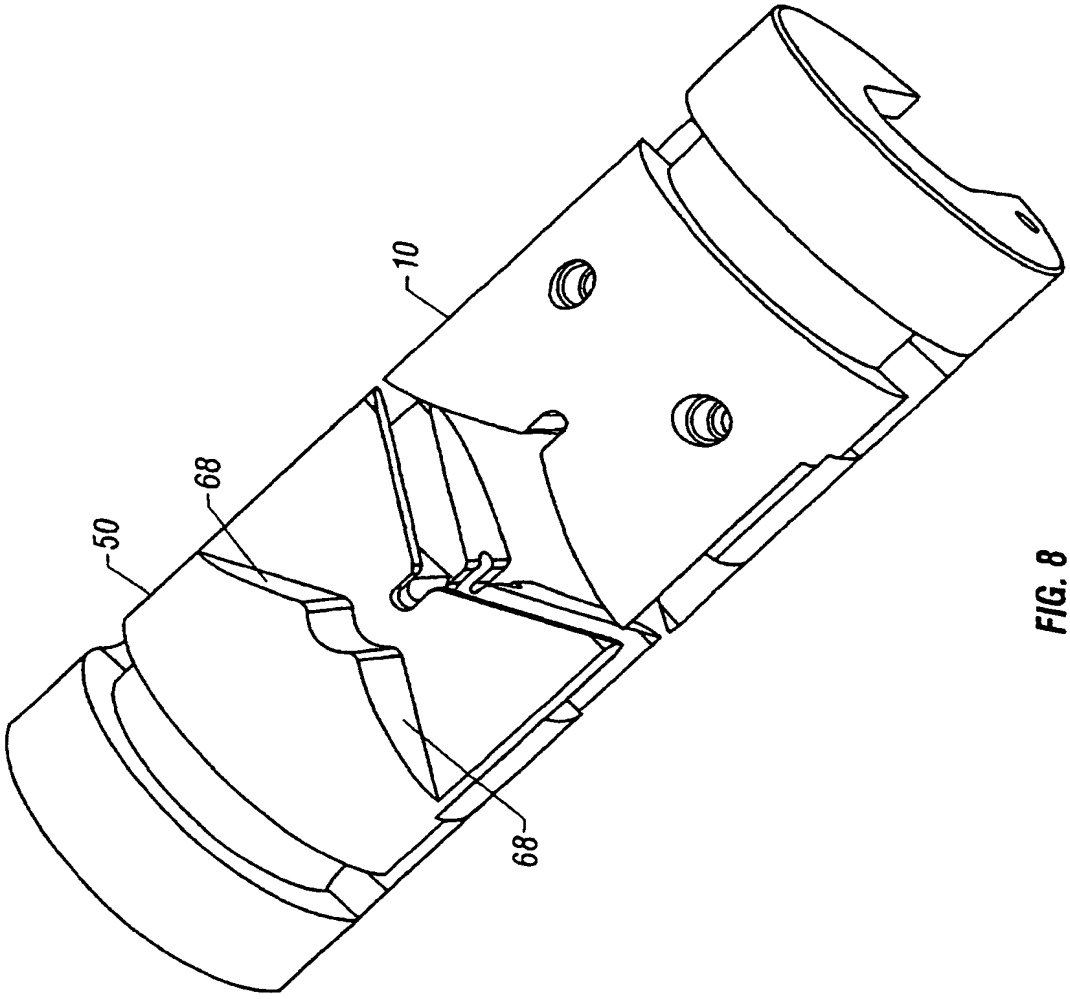


FIG. 8

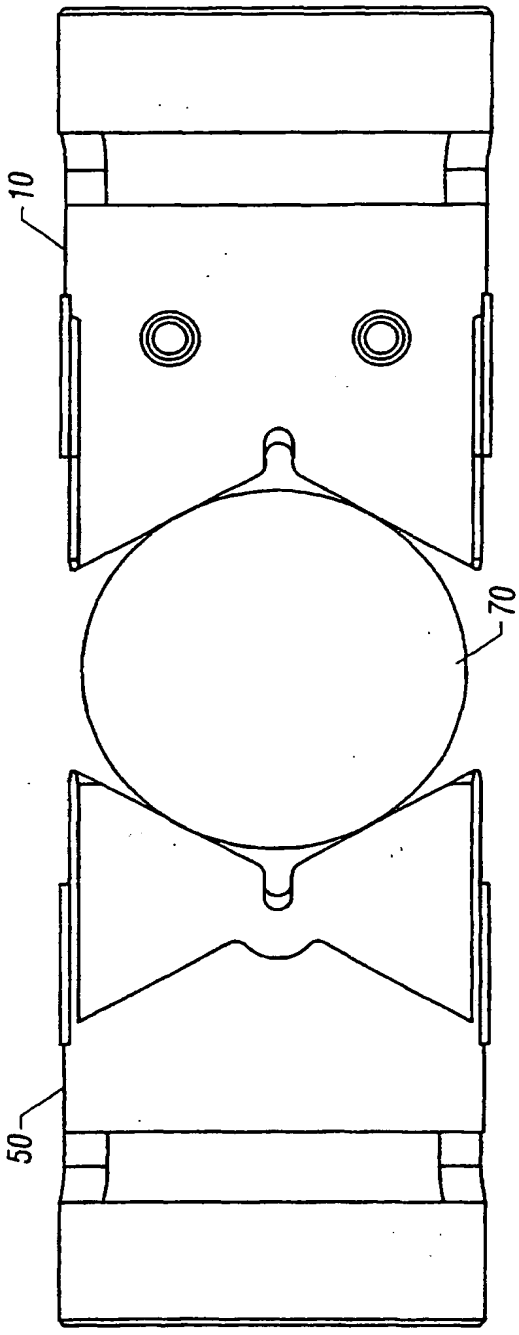


FIG. 9